CLAIMS

What is claimed is:

1. An active over passive coordinated motion winch device for use in a marine environment to position a payload and neutralize relative movement between said payload position and a destination position comprising:

a winch assembly including a drum, said drum having a hub defining an axis of rotation and a pair of flanges at opposing ends of said hub and perpendicular to said axis of rotation;

a control assembly constructed and arranged to selectively and operatively engage said winch assembly whereby variable torque and rotational speed or free rotation of said drum is provided;

a passive heave compensation assembly mechanically and fluidly connected with said control assembly, said passive heave compensation assembly including means for providing passive coordinated reciprocal movement between said payload position and said destination position;

an active heave compensation assembly mechanically connected to said winch assembly, said active heave compensation assembly including means for providing active coordinated reciprocal movement between said payload position and said destination position,;

whereby said passive heave compensation assembly and

said active heave compensation assembly cooperate with said winch assembly to reciprocally adjust the instantaneous payload position thereby neutralizing the relative movement between said payload position and said destination position.

2. The coordinated motion winch in accordance with claim 1 wherein said control assembly includes:

a main hydraulic power unit for supplying pressurized liquid to a primary hydraulic motor, said main hydraulic power unit fluidly coupled to said primary hydraulic motor via a primary supply tube, said primary hydraulic motor mechanically connected to said drum for providing selective power assisted rotational movement thereto.

3. The coordinated motion winch in accordance with claim 2 wherein said control assembly further includes a directional control valve, said directional control valve fluidly connected along said primary supply tube between said main hydraulic power unit and said primary hydraulic motor;

whereby operation of said directional control valve in a first direction permits a pressurized liquid to flow from said hydraulic power unit to said primary hydraulic motor, via said primary supply tube, to rotate said primary hydraulic motor in a first direction and whereby operation of said directional control valve in a second direction permits a pressurized liquid to flow from said hydraulic power unit

to said primary hydraulic motor, via said primary supply tube, to rotate said primary hydraulic motor in a second direction.

4. The coordinated motion winch in accordance with claim 3 wherein, said directional control valve is a infinitely variable positioning three way valve.

5. The coordinated motion winch in accordance with claim 3 wherein, said directional control valve is a infinitely variable positioning four way valve.

6. The coordinated motion winch in accordance with claim 3 wherein said means for providing passive coordinated reciprocal movement between said payload position and said destination position includes a gas spring accumulator, said gas spring accumulator having a variable volume gas portion and a variable volume oil portion, said gas portion and said oil portion being separated by a piston member, said gas portion fluidly coupled to an infinitely variable gas pressure source via a gas supply tube, said oil portion fluidly coupled to said primary supply tube between said primary hydraulic motor and said directional control valve;

wherein said gas spring acts to passively dampen response of said winch drum thereby reducing relative movement between said payload position and destination

position.

7. The coordinated motion winch in accordance with claim 6 wherein said means for providing passive coordinated reciprocal movement between said payload position and said destination position includes a gas intensifier fluidly connected to said gas supply tube between said gas pressure source and said gas portion of said gas spring accumulator;

whereby a gaseous fluid is supplied from said gas pressure source to said gas intensifier at a first pressure and said gaseous fluid is delivered from said gas intensifier to said gas portion of said gas spring accumulator at a second pressure.

8. The coordinated motion winch in accordance with claim 7 wherein said second pressure is greater than said first pressure.

9. The coordinated motion winch in accordance with claim 8 wherein said first pressure is at least about 500 pounds per square inch.

10. The coordinated motion winch in accordance with claim 8 wherein said second pressure is up to about 5,800 pounds per square inch.

11. The coordinated motion winch in accordance with claim 6 wherein said gas pressure source includes at least one tank containing pressurized fluid.

12. The coordinated motion winch in accordance with claim 1 wherein said means for providing active coordinated reciprocal movement between said payload position and said destination position includes a secondary hydraulic power unit for supplying pressurized liquid to a secondary hydraulic motor, said secondary hydraulic power unit fluidly coupled to said secondary hydraulic motor via a secondary supply tube, said secondary hydraulic motor mechanically connected to said drum for providing selective power assisted rotational movement thereto.

13. The coordinated motion winch in accordance with claim 12 including a servo-valve fluidly connected along said secondary supply tube between said secondary hydraulic power unit and said secondary hydraulic motor, said servo-valve having a controller for generating a signal to said servo-valve in response to data received from at least one sensory input, wherein a pressurized fluid supplied by said secondary hydraulic unit is allowed to flow to said secondary hydraulic motor for rotation thereof in response to data received from

said at least one sensory input;

whereby said servo-valve dynamically operates said secondary hydraulic motor in cooperation with said passive heave compensation assembly to neutralize relative movement between said payload position and said destination position.

14. The coordinated motion winch in accordance with claim 13 including a booster accumulator connected along said secondary supply tube between said secondary power unit and said servo-valve, said booster accumulator having a variable volume gas portion and a variable volume oil portion, said gas portion and said oil portion being separated by a piston member;

wherein said booster accumulator maintains a supply of pressurized fluid during operation of said secondary power supply.

15. The coordinated motion winch in accordance with claim 13 wherein said at least one sensory input receives data selected from the group consisting of drum acceleration, drum position, drum speed, gas spring piston position, payload acceleration, payload deceleration, gas intensifier pressure, stored fluid pressure, manual control valve position, pressurized fluid pressure or combinations thereof.